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THE UNIVERSITY OF ALBERTA

AN ANALYSIS OF CRAWFORD'S HIGH SCHOOL ALGEBRA, THE AUTHORIZED TEXT IN ALGEBRA I, IN THE SECONDARY SCHOOLS OF ALBERTA

A DISSERTATION
SUBMITTED TO THE GRADUATE FACULTY
IN CANDIDACY FOR THE DEGREE OF
MASTER OF ARTS

DEPARTMENT OF PHILOSOPHY

BY

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EDMONTON, ALBERTA
MAY, 1930.

Thesis
1930
#15

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CHAPTER I

PURPOSE OF THE INVESTIGATION

CHAPTER I

PURPOSE OF THE INVESTIGATION

This investigation is an attempt at a detailed and summary analysis of Crawford's High School Algebra, the authorized text in Algebra I, in the Secondary Schools of Alberta.

It is of interest to ascertain just how the course in Algebra I, as presented in the text, conforms with the purposes, aims and values set forth by modern pedagogy; and whether it provides an adequate means to a desirable introductory course in Algebra. To estimate the worth of the text requires a knowledge, of the type and extent of the theories, processes and applications that it embodies; how the material is arranged and distributed; the relative amount of theory, and to what extent it is substantiated by with applications; the amount of drill given to the various algebraic processes; to what extent problems are used, their kind and nature; and the fundamental algebraic principles and abilities the course constitutes.

It is the purpose of this investigation to provide the requisite data to an interpretation of the content of the course in Algebra I through a summary presentation of the facts obtained from a complete analysis of the prescribed text.

CHAPTER II

MATERIALS AND METHOD

CHAPTER II

MATERIALS AND METHOD

Materials

The only materials used in this investigation aside from a few references on the psychology and pedagogy of Algebra was Crawford's High School Algebra, Western Canada Series. The part of the text analysed includes "pages 1 to the bottom of page 151, along with Exercise 80, pp. 158-161, omitting -

(1) In the Chapter IX elementary work on H.C.F. pp.103 and 104, and L.C.M. pp. 107 and 108.

(2) In Chapter XI the Factor Theorem, pp. 142 and 143."

The above quotation was taken from the Handbook for Secondary Schools, Alberta, from the outlined course in Algebra I, page 109.

Method

1. A survey was made of the text as a whole to note the ground covered in the course in Algebra I in relation to the remainder of the book.

2. Each chapter was examined as to its context in relation to the other parts of the entire Algebra I course.

3. Every chapter was examined as to its content, that is, as to the kind and amount of theory and applications in it.

4. Each exercise was analysed into its component parts and all questions were classified into their particular categories.

Three sets of summaries were made from the data of the analysis:

(1) A summary was made of each chapter, giving the frequency of occurrence and the number of pages of theory and applications, respectively, contained within it.

(2) Another summary, giving the frequency and the amount of theory and applications, to cover the entire range of the Algebra I, for such types as occurred, in more than one chapter.

(3) Another summary consists of the types of problems, applications, and algebraic usages, recurring in the various chapters.

Totals are given in all summaries.

Further mention will be made of the methods employed in this investigation, as is required.

CHAPTER III

SUMMARY OF DATA

CHAPTER III

The results of the analysis will be given in this chapter in the form of tables. Table I gives a summary of the Frequency and Extent of Occurrence of Topics with Theory and Applications for each. Only such topics as occur in some related form in more than one chapter, are included. The other topics will appear in the summary of their respective chapters'. "Freq." stands for frequency or the number of occurrences or questions. "Pages" stands for the space occupied by the theory or applications with respect to a page measure, fourteen centimeters in length. The figures in the applications columns give all the possible occurrences, both primary and secondary, of the types of questions pertaining to each topic. Totals of each of the topics are given in the columns at the extreme right of the table. In the "Use of Brackets" topic, is given only the theory and application , devoted to special abilities and drills in such. The last topic traces through the total amount of theory and application, chapter by chapter, presented in the test as outlined for Algebra I. The total course numbers about one hundred and thirty-eight pages. This does not take into account the portions of the text, to be ommitted, and the parts of the pages unprinted.

Table I was of necessity arranged horizontally along three sheets in order to allow for proper spacing.

Table II gives a summary of the types of applications traced through each of the chapters of the text. The figures in each vertical column represent the number of questions or occurrences of the particular type of application in each of the chapters. A total column for all occurrences is given at the extreme right of the table. In the case of "exponents", as also with "brackets" and "fractional terms", the numbers recorded represent all usages of each, respectively, in each of the chapters of the text. Under the heading, "Formulae", is given all the applications made use of on general formulae, such as, $F = 9/5C -- 32$ and others. By the term "Decimals", is meant, those questions having decimal coefficients among their terms.

There are three sheets to this table. The third sheet gives a summary of the general types of questions and problems. To differentiate between problems and questions, all questions whose relationships were expressed to a greater degree verbally, were considered problems; those whose relationships were expressed arithmetically or algebraicly in the form of drill questions, were recorded as "questions". Problems dealing with "abstract" quantities were ascribed to such as were based on numerical and algebraic values, purely as such. The problems that presented relationships with more or less concrete situations were regarded as of the "concrete" type. The term"drill questions" was applied to those questions which functioned as drill exercises for specific algebraic processes.

TABLE I

FREQUENCY AND EXTENT OF OCCURRENCE OF TOPICS WITH THEORY AND APPLICATIONS

TOPIC	Chapter I				Chapter II				Chapter III				Chapter IV				Chapter V				Chapter VI				
	Theory		Applic.		Theory		Applic.		Theory		Applic.		Theory		Applic.		Theory		Applic.		Theory		Applic.		
	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Fr
Solution of simple equations of one unknown	-	-	-	-	1	1.57	71	2.50	-	-	1	.04	-	-	8	.40	-	-	15	.46	5	3.74	110	4.45	
Problems leading to solution of Simple equations of one unknown	-	-	-	-	2	1.93	52	2.80	-	-	-	-	-	-	-	-	-	-	-	-	1	2.00	65	4.00	
Miscellaneous questions on the solution of simple equations	-	-	-	-	3	2.24	13	.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Solution of simultaneous equations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Problems leading to solution of simultaneous equations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Solution of Quadratic equations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Simple factoring	1	.40	6	.17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Factors of Trinomials	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Factoring the difference of two squares	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Numerical applications of factoring by methods of difference of squares	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Factoring by other methods	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Product of the sum and difference	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Product of two binomials	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Chapter VI				Chapter VII				Chapter VIII				Chapter IX				Chapter X				Chapter XII				Chapter XII				Totals			
Theory		Applic.		Theory		Applic.		Theory		Applic.		Theory		Applic.		Theory		Theory		Applic.		Theory		Applic.		Theory		Applic.		Applic.	
Freq.	Pages	Freq	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq	Page	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages
5	3.74	110	4.45	-	-	-	-	-	-	-	-	-	-	1	.03	-	-	7	.36	-	-	-	-	-	-	-	-	6	5.31	213	8.24
1	2.00	65	4.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3.93	117	6.8
-	-	-	-	-	-	-	-	-	-	22	.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2.24	35	.95
-	-	-	-	4	3.56	68	2.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1.58	22	.8	7	5.14	90	3.35
-	-	-	-	-	-	47	3.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	3.2	-	-	74	6.4
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.0	14	.3	-	-	-	-	1	1.0	14	.30
-	-	-	-	-	-	-	-	1	1.	31	.45	-	-	24	.73	-	-	-	-	-	-	-	-	-	-	-	-	2	1.4	61	1.35
-	-	-	-	-	-	-	-	1	1.	42	1.00	-	-	15	.65	-	-	-	-	-	-	23	.58	-	-	-	-	1	1.0	80	223
-	-	-	-	-	-	-	-	1	.45	35	.87	1	.4	14	.50					1	1.6	77	2.30					3	2.45	126	3.67
-	-	-	-	-	-	-	-	2	1.5	9	.7	-	-	-	-	-	-	-	-	-	-	-	.07	-	-	-	-	2	1.5	11	.77
-	-	-	-	-	-	-	-	1	.95	7	.24	-	-	-	-	-	-	-	-	6	4.69	198	4.67	-	-	-	-	7	5.64	205	4.91
-	-	-	-	-	-	-	-	1	.35	18	.50	-	-	1	.02	-	-	-	-	-	-	-	-	-	-	-	-	1	.35	19	.52
-	-	-	-	-	-	-	-	1	.68	28	.64	—	—	—	—	1	.14	19	.27	-	—	—	—	—	—	—	—	2	.82	47	.91

TABLE I (Con't)

FREQUENCY AND EXTENT OF OCCURRENCE OF TOPICS WITH THEORY AND APPLICATIONS

TOPIC	Chapter I				Chapter II				Chapter III				Chapter IV				
	Theory		Applic.		Theory		Applic.		Theory		Applic.		Theory		Applic.		
	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Fr
Addition of Algebraic Quantities, simple and Compound	-	-	-	-	-	-	-	-	-	-	-	-	6	3.81	82	2.24	
Subtraction of Algebraic Quantities, Simple and Compound	-	-	-	-	-	-	-	-	-	-	-	-	3	1.72	101	2.91	
Addition and Subtraction of Algebraic Quantities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	.2	
Multiplication of Algebraic Quantities, (Simple and Compound)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Division of Algebraic Quantities, simple and Compound	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Multiplication and Division	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Use of Brackets (see Table II)	1	1.07	34	.86	-	-	-	-	-	-	-	-	-	-	-	-	
Total Theory and Primary Applications in all of Algebra I.	11	5.57	154	7.66	5	5.10	136	6.4	6	3.69	52	4.29	9	5.53	188	5.37	

	Chapter IV				Chapter V				Chapter VI				Chapter VII				Chapter VIII				Chapter IX			
ic.	Theory		Applic.		Theory		Applic.		Theory		Applic.		Theory		Applic.		Theory		Applic.		Theory		Applic.	
Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Page	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq	Page	Freq.	Pages	Freq.	Pages
-	6	3.81	82	2.24	-	-	10	.22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	3	1.72	101	2.91	-	-	55	1.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	4	.2	-	-	34	.75	-	-	-	-	-	-	3	.20	-	-	-	-	1	.46	25	.85
-	-	-	-	-	8	4.04	176	3.96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	4	1.94	69	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-1	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	.75
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4.29	9	5.53	188	5.37	12	5.98	240	5.84	6	5.74	186	9.20	4	3.56	115	5.75	10	7.73	262	6,83	7	3.22	118	3.72

Chapter VIII			
Theory		Applic.	
Freq.	Pages	Freq	Page
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
10	7.73	262	6,83

Chapter IX				Chapter X				Chapter XI				Chapter XII				Totals			
Theory		Applic.		Theory		Applic.		Theory		Applic.		Theory		Applic.		Theory		Applic.	
Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Pages	Freq.	Page	Freq.	Pages	Freq.	Pages
-	-	-	-	-	-	7	.3	-	-	-	-	-	-	-	-	6	3.81	99	2.76
-	-	-	-	-	-	38	1.5	-	-	-	-	-	-	-	-	3	1.72	194	5.71
1	.46	25	.85	-	-	9	.44	-	-	1	.04	-	-	-	-	1	.46	76	2.48
-	-	-	-	-	-	54	2.0	-	-	-	-	-	-	-	-	8	4.04	230	5.96
-	-	-	-	4	2.25	77	2.8	-	-	-	-	-	-	-	-	8	4.19	146	4.21
-	-	21	.75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	.79
-	-	-	-	2	2.3	39	1.3	-	-	-	-	-	-	-	-	3	3.37	73	2.16
7	3.22	118	3.72	8	6.00	197	7.89	11	8.47	330	7.48	4	3.18	67	4.27	93	63.85	2045	74.70

TABLE II

SUMMARY OF TYPES OF APPLICATIONS

Type Of Application Problems On:	Frequency Of Occurrence In Chapters -												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
Area	5	-	2	-	-	2	-	6	-	-	-	-	15
Perimeter	2	1	-	-	-	-	-	-	-	-	-	-	3
Circle	2	1	-	-	-	-	-	3	-	-	-	-	6
Volume	1	-	-	-	-	-	-	-	-	-	-	-	1
Rectangle & Square	-	1	-	-	1	1	-	2	-	-	-	-	5
Integers	-	-	-	2	-	2	-	1	-	-	1	-	6
Triangle	-	1	-	-	-	2	-	-	-	-	1	-	4
Sphere	-	-	-	-	-	-	-	1	-	-	-	-	1
#Exponents(Index or Power)	12	-	-	19	171	24	-	238	59	139	315	-	977
Coefficients	5	-	-	1	-	-	-	1	-	30	-	-	37
Decimals	1	1	3	1	2	5	5	3	-	-	-	1	22
Fractionals terms	16	26	1	9	12	52	41	15	118	8	4	23	325
Graphical Representation	2	-	8	-	2	-	-	-	-	-	1	-	13
Time, Rate, Distance	3	1	-	-	1	3	1	-	-	-	-	1	10
Brackets	28	4	-	41	55	56	6	49	6	68	-	3	316
Salary or Wage	1	2	-	-	-	-	5	-	-	-	-	3	11
Labor or Work	1	-	-	-	-	-	-	-	-	-	-	2	3
Formulae	2	3	-	-	-	3	-	3	-	-	-	1	12
Age	4	2	2	-	-	4	3	-	-	-	-	-	15
Denominate Numbers	27	9	11	-	2	30	15	-	-	-	-	11	105
Percentage	-	4	2	-	-	4	7	-	-	-	-	3	20
Identities	-	-	-	-	-	7	-	-	1	3	3	-	14
TOTALS	112	56	29	73	246	195	83	322	184	248	325	48	1921

TABLE II (Con't)

SUMMARY OF TYPES OF APPLICATIONS

Type Of Application Problems On:	Frequency Of Occurrence In Chapters -												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
Consecutive Numbers	-	2	-	2	-	8	-	2	-	-	1	-	15
Ratio and Proportion	-	3	-	-	-	2	-	-	-	-	-	2	7
Application of Physcial Sciences	-	1	2	-	-	6	-	-	-	-	-	-	9
Business and Commercial Problems	8	10	6	-	-	8	11	-	-	-	-	4	47
Commission	-	1	-	-	-	-	-	-	-	-	-	-	1
Interest	-	-	-	-	-	1	-	-	-	-	-	-	1
Problems in which a number is divided into two or more parts	-	4	-	-	-	9	-	-	-	-	-	5	18
Substitution	44	6	-	10	18	3	3	4	3	9	3	1	104
Clock - time	-	-	-	-	-	1	-	-	-	-	-	-	1
Coins	-	-	-	-	-	2	-	-	-	-	-	-	2
Digits	-	-	-	-	-	-	-	-	-	-	-	9	9
Geometrical Applications	-	-	-	-	-	-	-	-	-	-	-	1	1
Using term reciprocal	-	-	-	-	-	-	-	-	-	-	-	1	1
Verifications	-	85	-	4	39	167	71	-	-	35	118	52	571
Transposition of terms	-	-	-	-	-	124	29	1	-	4	-	-	158
TOTALS	52	112	8	16	57	331	114	7	3	48	122	75	945

TABLE II (Con't)

SUMMARY OF TYPES OF APPLICATIONS

Types Of Questions	Frequency Of Occurrence In Chapters -												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
Problems dealing with abstract Algebraic quantities	62	37	-	29	17	41	17	14	1	16	16	27	277
Problems with Concrete applications	37	33	52	-	4	38	30	4	-	-	1	13	212
Total Number of problems	99	70	52	29	21	79	47	18	1	16	17	40	489
Drill questions on Algebraic processes	55	66	-	159	219	107	68	244	117	181	313	27	1556
Number of oral questions in Algebra I	40	42	23	78	101	-	-	117	42	15	114	6	578
Number of written questions	114	94	29	110	139	186	115	145	76	182	216	61	1467
Sum total of questions in Algebra I	154	136	52	188	240	186	115	262	118	197	330	67	2045
Totals	561	478	208	593	741	637	392	804	355	607	1007	241	6624

The tables that follow are summaries of each of the chapters' covered in Algebra I. In each is recorded the types of theory and application, with data on the "Freq", or frequency and the space occupied given in terms of a fully printed page of the text (fourteen centimeters, long).

Table III

SUMMARY OF CHAPTER I.

"Algebraic Notation."

Topic	Theory		Application	
	Freq.	Pages	Freq.	Pages
Use of Arithmetical Signs	1	0.07	14	0.5
Algebraic Symbols	1	0.64		
Signs of Multiplication	1	0.57	60	3.5
Signs of Division	1	0.40		
Some Fundamental Laws	1	0.80		
Factor and Product	1	0.40	6	0.17
Power and Index	1	0.50	21	1.25
Coefficients	1	0.34	4	0.22
Addition and Subtraction of Like Terms	1	1.57	15	1.00
Use of Brackets	1	1.07	34	
Totals	11	5.57	154	7.66

To this summary, may be added that the exercises in this chapter presented, are of a fundamental character. They embody the essential basic elements of algebraic notation and symbolism, requisite to a further comprehension of algebraic ~~and~~ processes.

Table III (a) gives all occurrences, primary and secondary, of the types of algebraic abilities listed in this chapter.

Table III (a)

SUMMARY OF CHAPTER I.

TOPIC	Theory		Application	
	Freq.	Pages	Freq.	Pages
Use of Arithmetical Signs	1	0.07	14	0.5
Algebraic Symbols	1	0.64	130	7.0
Signs of Multiplication	1	0.57	31	1.7
Signs of Division	1	0.40	10	2.48
Some Fundamental Laws	1	0.80	14	-
Factor and Product	1	0.40	6	0.17
Power and Index	1	0.50	24	1.34
Terms of an Expression	1	0.21	-	-
Coefficient	1	0.34	5	0.24
Addition and Subtraction of Like Terms			25	1.8
Use of Brackets	1	1.07	34	0.86
Totals	11	5.57	293	16.09

TABLE IV

SUMMARY OF CHAPTER II

SIMPLE EQUATIONS

TOPIC	Theory		Application	
	Freq.	Pages	Freq.	Pages
Solution of Equations of One Unknown	1	1.57	71	2.50
Problems leading to the solution of equations of one Unknown	2	1.93	52	2.80
Drill in expressing and Reading Simple Algebraic Equations	-	-	3	.20
Substitution in and solution of Simple Equations	-	-	6	.57
Classifying Equations According Axioms	1	1.28	1	.20
Determining the roots of Equations	-	-	2	.08
Stating a problem the conditions which are expressed by an equation	-	-	1	.05
Verifying Results	1	.32	(85)	-
Drill on Illustrating the Method used with Reference to Axioms in Solving Equations	-	-	(19)	(.36)
Total	5	5.10	136	6.40

TABLE V.

SUMMARY OF ~~THE~~ CHAPTER III

"Positive and Negative Numbers"

TOPIC	Theory		Application	
	Freq.	Pages	Freq.	Pages
Practise in reading arithmetical numbers from graph	1	.60	11	.53
Drill on Positive and Negative numbers	5	3.07	27	2.7
Construction of graphs on Positive and negative numbers	-	-	8	.76
Interpretation of Positive and Negative numbers	-	-	6	.3
Total	6	3.67	52	4.29

TABLE VI

SUMMARY OF CHAPTER IV.

"Addition and Substraction"

TOPIC	Theory		Application	
	Freq.	Pages	Freq.	Pages
Addition of simple quantities of like signs	2	1.14	12	.25
Addition of Compound expressions of like terms quantities	2	.68	22	.73
Addition of unlike signs	1	1.37	25	.68
Indicated additions (positive, negative)	1	.62	23	.6
Drill on subtraction as the inverse of addition	1	.38	18	.40
Subtraction of simple and compound quantities			46	1.30
Drill on rules of subtraction, e.g. changing signs	1 ~~1~~	.7 ~~.64~~	14 ~~23~~	.35 ~~.86~~
Indicated subtractions	1	.64	23	.86
Addition and subtraction of simple and compound quantities	-	-	4	.2
Total	9	5.53	188	5.37

Miscellaneous Applications and Usages:

Solution of simple equations	8	.4

TABLE VII

SUMMARY OF CHAPTER V.

"Multiplication and Division"

TOPIC	Theory		Application	
	Freq.	Pages	Freq.	Pages
Multiplication of positive simple quantities	1	.44	20	.46
Drill on the Index Law for multiplication	1	.24	18	.20
Drill on Multiplication by a negative quantity and on rule of signs in multiplication	2	.71	25	.35
Multiplication of several simple factors	1	.71	31	.80
Compound multiplication	1	.58	29	.80
Multiplication by a compound quantity	1	1.00	40	1.35
Checking results of multiplication	1	.36	(")	(")
Drill on multiplication through substitution of values for unknowns	-	-	7	.40
Simple division by a simple positive quantity	1	.74	5	.08
Index law for division	1	.4	14	.22
Simple division with drill on rules of sign	1	.4	22	.40
Division of a compound quantity by a simple one	1	.4	25	.57
Division of compound quantities by simple and several simple factors	-	-	2	.10
Drill on multiplication and division by simple factors	-	-	1	.07
Stating rules of sign in multiplication and division	-	-	1	.04
Total	12	5.98	240	5.84

Solution of simple equations	14	.44
Addition and subtraction of algegraic quantities	34	.75
Addition of Algebraic quantities	10	.22
Subtraction of Algebraic quantities	55	1.3

TABLE VIII

SUMMARY OF CHAPTER VI

"Simple Equations"

TOPIC	Theory		Application	
	Freq.	Pages	Freq.	Pages
Drill on distinguishing between identity and equation	2	.9	7	.27
Solution of equations with drill on transposition of terms	1	1.7	53	2.20
Solution of simple equations with fractional coefficients	2	1.14	52	2.20
Problems leading to solution of simple equations	1	2.00	65	4.30
Algebraic statements of arithmetical theorems	-	-	8	.5
Rules of transposition	-	-	1	.03
Total	6	5.74	186	9.20

Miscellaneous usages (included in above):

Total drill on transposition	124
Total verifications	167

TABLE IX

SUMMARY OF CHAPTER VII.

"Simultaneous Equations"

TOPIC	Theory		Application	
	Freq.	Pages	Freq.	Pages
Solution of equations with two unknowns- simultaneous equations	2	2.90	34	1.2
Methods of Elimination	1	.31	-	-
Problems leading to solution of simultaneous equations	-	-	47	3.2
Total	4	3.56	115	5.75

Miscellaneous Usages (included in above)		
Solution of (simple) simultaneous equations involving transpositions	29	
Questions involving simplification, addition and subtraction	3	.2

TABLE X

SUMMARY OF CHAPTER VIII

"Type Products and Simple Factoring"

TOPIC	Theory		Application	
	Freq.	Pages	Freq.	Pages
Simple factoring	1	1.	31	.45
Product of Two Binomials	1	.68	28	.64
Factors of Trinomials	1	1.00	42	1.00
Square root of monomials	1	1.25	25	.7
Square root trinomials	1	.65	36	.9
Squares of Binomials	1	.7	36	.9
Product of the Sum and Difference	1	.35	18	.5
Factors of the difference of Two Squares	1	.45	33	.8
Numerical applications of Products and Factors	1	.95	7	.24
Geometrical applications of Products and Factors	1	.7	2	.55
Simplification, squaring, multiplication of Binomials	-	-	4	.15
Total	10	7.73	262	6.83

Other Usages (included in above)

Solution of simple equations involving the square root of monomials	5
Solution of equations involving the square root of binomials	3
Solution of Equations involving the square root of one trinomial	1
Solution of equations involving factoring the difference of two squares	13

TABLE XI

SUMMARY OF CHAPTER IX

"Simple Applications Of Factoring"

TOPIC	Theory		Application	
	Freq.	Pages	Freq.	Pages
Reducing fractions to Lowest terms	1	.86	46	1.5
Algebraic fractions	2	.53	-	-
Multiplication and division of fractions	1	.4	21	.75
Addition and subtraction of fractions	1	.46	24	.75
Reduction of mixed expressions to complete fractions	1	.75	15	.32
Reduction of complete fractions to mixed fractions	1	.22	9	.23
Factoring involving reduction of terms and addition of fractions	-	-	1	.1
Solution of equation involving factoring and division	-	-	1	.04
Drill in factoring by filling in blanks in indentity				
Total	7	3.22	118	3.72
Other Usages (included in above)				
Solution of simple equation			1	.03
Factoring Difference of Two Squares			14	.5

TABLE XII

SUMMARY OF CHAPTER X

REVIEW OF THE SIMPLE RULES

TOPIC	Theory		Application	
	Freq.	Pages	Freq.	Pages
Drill on Use of Brackets	1	1.70	32	1.00
Drill on Use of Horizontal Bar	-	-	3	.1
Insertion of Quantities in Brackets	1	.60	4	.2
Collecting Coefficients	1	.20	15	.6
Multiplication of Algebraic Quantities	-	-	12	.5
Multiplication with Detached Coefficients	1	1.25	8	.42
Multiplication of Compound Quantities	-	-	27	1.30
Division by Compound Quantities	1	.80	49	1.70
Verifying Division	1	.25	(22)	(0.5
Division with Detached Coefficients	1	.4	7	.25
Inexact Division	1	.8	23	.86
Addition of Compound Quantities	-	-	2	.08
Subtraction of Compound Quantities	-	-	6	.25
Addition and Subtraction of Compound Quantities	-	-	1	.07
Multiplication through substitution of Numerical values	-	-	4	.25
(same as previous)	-	-	1	.04
Multiplication and Division to prove Identities	-	-	3	.27
Total	8	6.00	197	7.89

Other Usages (included in above)

Removal of Brackets	45	2.00
Addition of Compound Quantities	7	.3
Subtraction of Compound Quantities	38	.3
Addition and Subtraction of Compound Quantities	9	.43
Total Multiplications	54	2.00
Total Divisions	79	2.85
Questions on Identities	4	0.15
Solution of Simple Equations	7	0.36
Verifications	7	

TABLE XIII

SUMMARY OF CHAPTER XI

"FACTORING"

TOPIC	Theory		Application	
	Freq.	Pages	Freq.	Pages
Factors common to every term	1	.24	9	.14
Factors by grouping	1	.70	26	.80
Square by binomials(Complete squares)	1	.14	17	.18
Squares of trinomials	1	.90	8	.35
Squares of polynomials of four terms	-	-	3	.10
Drill in expressing trinomials as squares of binomials	-	-	9	.13
Square root of trinomials	-	-	14	.45
Drill on completion of squares of binomials by supplying missing terms	-	-	4	.87
Drill on completion of squares of trinomials by filling in missing blanks	-	-	2	.04
Drill on completing square of trinomials	-	-	3	.09
Square of trinomials and binomials	-	-	1	.05
Factoring by difference of squares	1	1.60	59	1.45
Product of sum and difference	-	-	18	.47
Factoring by incomplete squares	1	1.0	20	.37
Trinomials	1	.14	-	-
Factoring by"cross multiplication"	1	.93	58	1.20
or by the method of "decomposition"	1	.97	-	-
Factoring the sum of cubes	1	.85	19	.40
Factoring the difference of cubes	1	.85	26	.43
Factoring the sum and difference of cubes	-	-	1	.04
Solution of quadratic equations	1	1.00	14	.30
Drill in solving the eqivalents of equations of the first degree from quadratics	-	-	10	.24
Drill on stating equations whose roots are given	-	-	6	.09
Finding the roots of a quadratic when one root is given	-	-	1	.04
Product of binomials	-	-	1	.04
Diagramatic representation	-	-	1	.04
Total	11	8.47	330	7.52

Miscellaneous applications and usages in Chapter XI.

Addition and subtraction of compound quantities	1	.04
Numerical application of factoring by differences of squares	2	.07
Questions on identities	3	.1
Total number of questions on difference of squares	77	2.2-3
Questions using term "root"	7	.23
Verification by multiplication	10	
Total Verifications	118	

TABLE IV.

SUMMARY OF CHAPTER XII

"Simultaneous Equations"

TOPIC	Theory		Application	
	Freq.	Pages	Freq.	Pages
Drill in expressing one unknown in terms of another in a simple equation e.g., solving by elimination	(1)	.22	6	.1
Solution of simultaneous equations by substitution(and verification)	1	.9	6	.13
Solution (and verification) of simultaneous equations by elimination by comparison	1	.46	3	.07
Solution of simultaneous equations by any method	-	-	13	.6
Problems leading to solution of simultaneous equations:	1	1.6		
One unknown or two unknowns			10	.7
Two unknowns	-	-	27	2.5
Substitution of given values for unknowns in formula	-	-	1	.09
Translating a verbal problem into the form of an algebraic equation	-	-	1	.08
Total	4	3.18	67	4.27

Supplementary data:

Verbal problems	40	3.2
Questions dealing abstractly with numbers	27	1.
Problems dealing abstractly with numbers	27	1.4
Total Verifications	52	

CHAPTER IV.

A DETAILED ANALYSIS OF EACH EXERCISE

CHAPTER IV.

A DETAILED ANALYSIS OF EACH EXERCISE INTO ITS COMPONENT PARTS WITH A CLASSIFICATION OF EACH QUESTION INTO ITS SPECIFIC CATEGORY.

This chapter gives a detailed analysis of the types of questions presented in each exercise covered in the course. The data is here presented in the order of presentation given in the text.

Chapter 1.

Chapter 1. of the text deals with "Algebraic Notation". A detailed analysis of the types of questions in each exercise is given below.

Exercise I.

Theory- "Use of Arithmetical Signs."

Types of Questions:

	Number of Questions	
A. Arithmetical Additions........	3	
		2
B. Arithmetical Subtractions.....	4	
		1
C. Arithmetical Multiplication...	1	
		1
D. Arithmetical Division.........	1	
E. Squares and Square Root.......	1	
Total............................	14	

Exercise II.

Theory- Algebraic Symbols; Signs of Multiplication; Signs of Division; Some Fundamental Laws.

Exercise II.

Types of Questions:

A. Substitution:- Of the type- "When $x=5$ and $y=3$, what are the values of $x+y$

	Unknowns				
	One	Two	Three	Four	Total
Number of Questions	1	4	7	3	15

B. Drill on Algebraic Notation with the following applications:

	Perimeter	Applications with Denominate Numbers	Drill in Use of Symbols
Number of Questions	2	1	7

Graphical Representation	Problems on Age	Integers	Area
2	1	1	1

Total.................................. 15

Total number of Questions in Exercise II.... 30

Frequency of Substitutions................. 39.

Exercise III.

Questions on:	Oral	Written	
Prime Factors..............	1		
Simple Factoring...........	1		
Drill in Factoring.........	2	1	
Exponents or Indeces.......	5		
Substitution...............	5	9	
	14	10	24

Exercise III. (continued)

Theory: Factor and Product; Power and Index.

Applications: Questions on Time Relations... 2;
Area, 1 ; Circle, 1.; Volume, 1.

Exercise IV.

Theory: Terms of an Expression; Coefficient: and Addition and Subtraction of Like Terms.

Types of Questions:

Numerical Coefficients............	3		
Addition of Like Terms............	2	2	
Addition of Like Terms and Substitution..................		3	
Substitution......................	1	4	
Simplification of Like Terms......	2	4	
Total number of questions.....	8	9 =	17

Applications: Salary, 1 ; Space, 1; Identity, 1.

Exercise V.

Theory: Use of Brackets.

Questions on the Use of Brackets: Oral 17, Written 5; Dividing Line, 3 questions; Substitution involving usage of brackets, 5 questions.

Total number of questions ...... 30.

Exercise VI.

Types of Questions:

Drill on the Use and Value of Algebraic Symbols				22
Substitution	One unknown	1		
	Two unknowns	4		
	Three unknowns	2	Total.......	9
	Four unknowns	2		

Exercise VI. (continued)

	Number of Questions	
Use of Brackets	1	(3 unknowns)
Addition of Like Terms	1	
Simplification (Addition and Subtraction)	1	
Questions on Average	1	(3 parts)
Problem on Age	1	
Power or Index	1	(4 parts)
Factoring	1	(4 parts)
Total	8	

Total number of questions in the exercise- 39

Miscellaneous Application (included in the above)

Problems on Denominate numbers--	12
Problems dealing with time, rate, or distance ,-----	3
Problems with decimals -----	1
Use of Exponents----	6
Total number of substitutions, including all parts----	30

A summary of Chapter I is given in Chapter III. of this investigation.

Chapter 2.

Chapter II. of the text deals primarily with the solving of Simple Equations. An analysis of each of the exercises follows.

Exercise VII.- Oral

Theory: Idea of Equality; The Equation; Solving an Equation.

Types of Questions:

Drill in solving simple equations of one unknown:

	Number of Questions	
Numerical equations	1	(6 parts)
Algebraic equations: e.g., $8+x=20$.	22	(27 parts)
Expressing and reading equations	2	(7 parts)
Total	25	(40 parts)

Miscellaneous Usages:

Questions with fractional terms--	5
Questions using brackets--	3

Exercise VIII. Oral

Theory: Axioms used in Solving Equations.

Types of Questions:

Drill on solving simple equations of one unknown.................. .... 17 questions.
(with fractional terms, 5)

Drill in classifying equations according to axioms involved in their solution:

Axiom I.-- 2; Axiom II.-- 1 ; Axiom III. -- 2 ; Axiom IV..4.

Total number of questions in Exercise VIII. --- 17

Exercise IX.

Theory: Verifying the Result.

Solving Equations of one unknown: e.g., $2x+5=27$.

19 questions.
(Drill in expressing or writing equations... 3)

Exercise X.

Types of Questions:

Stating the condition of a problem in the form of an equation .... 8 questions.

Solving the above stated equations,, 1 question (8 equations).

Total number of questions......... 9

Exercise XI.

Problems leading to solution of equations of one unknown........ 35 problems.

Questions on substitution........... 1.

Total number of questions............ 36.

Exercises with applications,included in the above:

Salary	Age	Area	Perimeter	Rate, Time And Distance	Denominate Numbers
1	2	1	1	1	1

Percentage	Ratio and Proportion	Consecutive Numbers	Fractional Terms
2	3		

The numerals placed under each represents the number of questions in which each occurred.

Exercise XII. Review of Chapter II.

	Number of Questions
Drill in stating axioms....	1 (all 4 axioms)
Problems leading to solution of simple equations (one unknown)	17
Solution of Equations, such as, $5x+3=2x+9$	4 (32 parts)

Exercise XII. (continued)	Number of Questions
To determine the root of an equation	2 (12 parts)
Substitution in Formulae: e.g., If $S=1/2ft^2$, find S, when t=4, f=32.--	(12 parts)
Stating aproblem the condition of which is expressed by an equation............ (3x-20=x	1
Total number of questions......	30

Miscellaneous Applications and Usages.
(included above)

Questions on ratio and proportion	1
Questions on Per Cent..................	2
Questions on area......................	1
Questions using decimals...............	1
Questions on denominate numbers........	8
Number of verifications.....	1 (3 parts)
Questions with fractional terms........	4
Questions on triangle	1
Questions on circle	1
Questions on rectangle.................	1

A summary of all the type questions of this chapter is given in Chapter III. of this investigation.

Chapter 3

"Positive and Negative Numbers"

Exercise XIII. Oral.

Theory: Aritmetical Numbers.	Number of Questions
Drill in reading a temperature-time graph..... (Number of readings, 23)	8
Construction of simple graphs................ (Number of points marked, 13)	2
Total number of questions............	10..

Exercise XIV.

Theory: Negative Numbers.

Drill in reading positive and negative numbers from a graph	3 questions (13 read.)
Drill on Positive and Negative numbers	2 questions.
Construction of graph with positive and negative numbers	1 question.
Total number of questions	6

Exercise XV.

	Number of Questions
Drill on Positive and Negative numbers (29 parts)	17
Interpretation of Positive and Negative numbers	2
Construction of graph of positive and negative numbers	1
Total number of questions	20

Exercise XVI.

Theory: (for Exercise 15 and 16.)

"Distances measured on a Horizontal Line.
Further Examples of Negative Numbers.
Signs of Operation and Signs of Quality.
Absolute Value"

	Number of Questions
Drill in Positive and Negative numbers	8
Interpretation of Positive and Negative numbers	4
Graphical construction of positive and negative numbers	4
Total number of questions	16

Other applications (included in above questions)

Questions dealing with Age, 1; Equations of Negative numbers, 1: Temperature graphs, 4. : Temperature, 6. See summary, Chapter III.

Chapter 4.

"Addition and Subtraction"

Exercise XVII.- Oral

Addition of Positive Quantities. (Theory)

Addition of simple Negative Quantities.

Addition of simple quantities of Like Signs:

	Numerical Quantities	Algebraic Quantities
Positive Numbers	2 questions	3 questions
Negative Numbers	3 "	4 "

Total number of Additions, 12.

Addition of fractional terms, 2 questions.

Exercise XVIII.

Theory: Compound Expressions; Addition of Compound Expressions.

Addition of Compound Expressions:

Oral:

Addition of numerical Denominate numbers... 2

Addition of algebraic compound expressions. 4

Number of oral questions.................. 6

Written:

Addition of Compound Quantities of Like Signs:

Number of expressions Added	Number of Terms per Expression 1	2	3	4	
2		1		1	questions
3			5	1	"
4			1		"
5		1			"
Total number of Additions....			10		

Total number of questions ... 16. (Oral 6, Written, 10)

Addition of fractional terms .... 2 questions.

Exercise XIX.

Theory: Addition of Quantities with Unlike Signs.

Addition of Quantities with Unlike Signs:

Number of Expressions Added	Number of Oral Questions		Number of 'Written' Questions				
	Numerical Terms	Algebraic Terms	Number of Terms per Expression				
			1	2	3	4	
2(single)	5	3					
2 (compound)		4					
2					1		
3				2	6		
4				1	2	1	
6			1				
Total	12		13				= 25

Miscellaneous Usages:

Solution of simple equations.................. 2 questions.
Addition of fractional terms of unlike signs... 2 questions.
Number of questions to be checked or verified.. 6

Exercise XX.

Theory: Indicated Additions.

Indicated Additions:

Number of Expressions Added	Number of Terms per Expression				
	1	2	3	4	5
1				1	2
2	—	2			
3 (Written)			2	1	
4				1	
6	1				
Total (Written)	10				
" (Oral)					

Numerical Problem on Indicated Addition... 1 question.
Total Written questions......................11 .

Total, 23

Oral: Numerical Additions.... 4. Total.... 12
Algebraic Additions.... 8.
(Two terms per expression..... 7 questions.)
(Three terms per expression of two,.... 1 question.)

Miscellaneous Usages:
Solution and verification of simple equations......... 2 questions.

Exercise XXI. Oral.

Theory: Subtraction is the Inverse of Addition.

Addition as the Inverse of Addition:

Number of questions with numerical terms.....10
Number of questions with algebraic quantities 8
Total number of questions,................. 18

Exercise XXII.

Theory: Rule of Subtraction.

Drill on Rule of Signs in Subtraction:

	Number of Expressions	Numerical Terms (1)	Algebraic Terms 1	2	3
Number of questions	(2)	2	6		
	(2)			3	3

Total.................... 14 questions.

Exercise XXIII.

Drill in Subtraction:

Oral:

Subtraction of Numerical quantities: e.g., $\begin{array}{r}-12\\ \underline{-6}\end{array}$, 4 quest.

Subtraction of Alfebraic quantities: e.g., $\begin{array}{r}-7a\\ \underline{2a}\end{array}$ 4 quest.

Total number of subtractions.....8

Written:

Number of Expressions Added		Number of Terms per expression: Numerical Terms 1	2	3	4	Algebraic Terms 1	2	3	4
~~2~~									
2	(3)	1	(1)	(1)			5	10	1
3								1	
4								1	

Total number of questions .... 19.
Total number of questions, otal and written......... 27

Miscellaneous Usages:
Questions on substitution............. 1
Questions to be checked............... 2
Additions and Subtractions............ 6 questions.

Exercise XXIV.

Theory: Indicated Subtractions.

Drill on Indicated Subtractions:

Simplification- subtractions, change of signs of quantities in brackets: e.g., -5-(-6)

Number of Expressions Added	Number of Oral Questions with		Number of 'Written' Number of Terms per Expression			
	Numerical Terms (1)	Algebraic Terms (1)	1	2	3	4
2	2	4		1	2	
3	1	3		1	2	
						(2)
3 and4					1 (f.2)	
Total	10		7			

Substitution with drill on Indicated Subtractions:

Substitution for:	1 unknown	2 unknowns	3 unknowns	
Number of Questions	1 (f.5)	1	2	Total, 4. (f.8)

Solution of Simple Equations with drill on

Indicated Subtractions, 2 questions, frequency,4.
(2 expressions of 2 terms.... 2 questions)
(3 " " " " .... 1 ")
(4 " " " " .... 1 ")

The quantities in brackets represent the frequency of occurrence of each type, or the number of parts to a question. "f" stands for frequency.

Total number of questions in this exercise... 23

Number of verifications...... 1 question, (f.3)

Exercise XXV. Review of Chapter IV.

Addition of Algebraic Quantities:

Number of Expressions Added	Number of Questions		
	Number of Terms per Expression		
	1	2	3
2		1	1
3			1
4	2	1	
5	1		
Total..................		6	

Addition and Subtraction of Algebraic Quantities:

Number of Expressions	Number of Terms per Expression	Number of Unknowns		Number of Questions
3	3	3	-----	1
4	2	2	-----	1
4	3	1	-----	1

Total Number of Subtractions 3

Solution of Simple Equation with drill on Addition
(2 expressions of 2 terms)
of Algebraic Quantities and Substitution, 1 question.

Subtraction of Algebraic Quantities:

Number of Expressions	Number of Questions		
	Number of Terms per Expression		
	One	Two	Three
2	1 (f.2)	2	7

Total Number of Subtractions...................... 10

Substitution with Drill on Subtraction:

Number of Expressions	Number of Terms per Expression	Number of Unknowns	Number of Questions
3	2	2	1
3	3	3	2
1	2	2	1
2	2	4	1

Total number of Substitutions.............. 5

Exercise XXV. (continued)

Simplification: e.g., Addition and Subtraction of Algebraic Quantities, (3 expressions of 3 terms), Rules of Sign in Subtraction........... 1 question

Solution of Simple Equations with drill on Subtraction:

2 expressions of 3 terms............	1 question.	Total,4.
3 " " 2 terms............	3 questions.	

Miscellaneous Usages: (included in the above)

Questions with decimal terms.............	1
" " fractional terms..........	1
" " integers..................	2
Drill in Use of Brackets, change of signs	5
Questions on solution of Simple Equations	5
" to be verified................	1

Total number of questions in Execise XXV. ,,,,,,,,, 30

See Summary of Chapter IV. of the text in Chapter 3 of this investigation.

Chapter 5

'Multiplication And Division'

Exercise XXVI. (Oral)

Theory: Multiplication of Simple Positive Quantities; The Index Law for Multiplication.

Multiplication of Simple Quantities.... (involving indeces)	17	questions.
Multiplication of Simple Quantities.... (without indeces)	4	"
Total.................................	21	questions.

Miscellaneous Usages: (included above)

Questions with brackets...........	3
Questions with fractional terms...	4

Exercise XXVII. (Oral)

Theory: Multiplication by a Negative Quantity:

Rules of Sign for Multiplication.

Drill on Rules of Sign in Multiplication:

Arithmetical Terms...	6 questions.
Algebraic quantities	19 "
Total	25 "

Miscellaneous Usages

Use of Brackets	4 questions.
Use of Fractional Coefficients.	2 "
Drill on Law of Indeces	12 "

Exercise XXVIII.

Theory: Multiplication of several Simple Factors.

To find the Product of several:

Numerical Factors	9 questions.
Literal Factors	9 "
Total number of oral questions	18

Substitution with drill on Multiplication of several Simple Factors, Law of Indeces.

Number of Expressions	Number of Terms per Expression	Number of Unknowns	Number of Questions	
8	(4-1 term)			
	(4-2 term)	2	1	(frequency, 8)
1	3	3	1	
3	2	3	1	
4	4	3	1	
2	2	2	1	
4	4	4	5	
2	2	2	1	
Total Substitutions			11	

Exercise XXVIII. (continued)

Subtraction involving Multiplication of Trinomials by a Binomial, ... 1 question.

Substitution involving Multiplication of Trinomials by Monomials,........................ 1 question.

Total number of Questions on Compound Multiplication........................ 29

Miscellaneous Usages:

Use of Brackets.......... 22 questions.
Use of fractional terms.. 1 "

Exercise XXX.

Theory: Multiplication by a Compound Quantity.

Checking Results.

Multiplication of a Binomial by a Binomial, such as, $\begin{array}{l} a-4 \\ \underline{x+y} \end{array}$, ... 16 questions.

Multiplication of Binomial quantites in brackets, such as, (3a-4b)(2a-3b), ... 5 questions.

Squaring Binomials: e.g., 2a+b,. 3 questions.

Subtraction of products of Binomials in brackets; e.g., (x+8)(x-9) from (x+3)(x+4),......... 3 questions.

Addition and Subtraction as above.. 1 question.

Simplification, involving multiplication of Binomials and by Monomials, Addition and Subtraction; e.g., 2(a-b)(2a+b)-3(a+b)(a-2b), etc.,... 6 questions.

Solution of Simple Equations, involving multiplication of Binomials by Monomials and Binomials, Addition,

Exercise XXVIII. (continued)

Multiplication of several Simple Factors with Drill on Rules of Signs and Removal of Brackets; e.g., $(-3)^4$., 2 questions, (10 parts). Total, 31 questions.

Miscellaneous Usages:
Use of Fractional terms.... 2 questions.
Use of Indeces............. 20 questions.
Use of Brackets........... 3 "

Exercise XXIX.

Theory: Compound Multiplication.

Types of Questions:

Multiplication of a Binomial by a Monomial:

By a numerical term.......3 questions
By numerical and literal factors........ 2 questions

Multiplication of a trinomial by a literal factor, 1 question.

Multiplication of Binomials in Brackets by a Monomial:

By numerical factors.................. 4
By numerical and literal factors..... 2
Total, 6.

Simplification, involving Compound Multiplication, Addition and Subtraction:

3 expressions of 2 terms 3 expresions of 2 terms

5 questions 4 questions.

Total, 9.

Solution and Verification of Simple Equations involving Compound Multiplication, and simplification, such as, Addition and Subtraction, 5 questions .

Addition of Algebraic Quantities with drill in Compound Multiplication, 1 question.
(3 Binomial 3xpressions)

Exercise XXX. (continued)

Subtraction, Removal of Brackets; e. g., $(x+11)(x-2) = (x-7)(x-1) + 107$, ... 6 questions. Total, 40.

Miscellaneous Usages:

Substitution (compound values)...	3 questions.
Time Rate and Distance Problems	1
Number of required verifications	25
Use of Decimals..............	1

Execise XXXI.

Theory: Division by a Simple Positive Quantity.

Division by a Simple Positive Quantity using Dividing Line: e.g., $\frac{3xy}{y}$.

Simple Products $(mn \div n)$	**Products with Indeces $\left(\frac{mn^3}{mn}\right)$**
4 questions	**6 questions**

Division by a Simple Positive Quantity, using Division Sign:, e.g., $10a^3 \div 5a$, ... 7 questions.

Total............................ 10 questions.

Miscellaneous: Fractional terms used, 3 questions.

Exercise XXXII. (Oral)

Theory: Rules of Sign for Division.

Drill on Rule of Signs in Division: e.g., $ab \div -a$.

	Arithmetical Divisions	Algebraic Divisions	
		Simple Quantities	Quantites with Indeces
Number of Questions	8 (frequency 5)	3	10

Total.. 22.

Decimal Divison................ 1.

Exercise XXXIII.

Theory: Division of A Compound Quantity by a Simple One.

Oral: Division of a Binomial by a Monomial: e.g., axy-ay by ay, etc.,............................ 15 questions.

Written: Simplification, with drill on Division of a Compound Quantity by a simple one, Addition and Subtraction: e.g., $\frac{ab-ac}{-a} + \frac{bc-ab}{-b}$,,,,,,,......................... 9 questions.

Solving and Verifying Simple Equations with drill on Division of a Binomial by a Monomial....... 1 question.

Total ....25 questions.

Exercise XXXIV. Review of Chapter V.

Questions on Rules of Sign in Multiplication and Division.. 2.

Substitution, involving Compound Multiplication, change of signs................................ 7 questions.

Simplification, involving

Multiplication ofBinomials in Brackets, and Addition	Multiplication of Binomials and Addition	Multiplication of Binomials and Subtraction	Mult. Division and Subtraction
2 questions	1 question	1 question	2 questions

Division of a compound quantity by a monomial, and Addition.......................... 1 question.

Total number of simplifications 7

Multiplication of Binomials:

Quantities in Brackets	Not in Brackets	Binomials Squared and Added.
1 question	2 questions	1 question

Exercise XXXIV. (continued)

Multiplication of Binomials and Subtraction....... 1 question.

Division of a Compound Quantity by a Simple One... 1 "

Substitution involving compound multiplication.... 1 "

Division of a compound quantity by a simple one... 1

Graphical representation of Compound Multiplication:

Multiplication of Monomials, 1 question.

Total.....2

Multiplication of Binomials, 1 question.

Solution of Simple Equations and Verification, involving Compound Multiplication, addition, etc., ... 2 question.

Total Number of Questions..................... 28.

See Summary for Chapter 5 of the text in Chapter III. of this Analysis.

Chapter 6.

" Simple Equations"

Exercise XXXV.

Theory: Definition of Equation. Identity.

Drill on distinguishing between equations and Identities, ... 6 questions.

Miscellaneous Usages:

Compound Multiplication, ... 6 questions.
Additions .... 6 "
Use of Indeces............... 5 "

Exercise XXXVI.

Theory: Transposition of Terms.

Solution of Simple Equations, involving Transposition of Terms: e.g., $3-3x=9-5x$.

Exercise XXXVI. (continued)

Simple Equations	Equations with Quantities in Brackets	Multiplications of Binomial Quantities in Brackets and Solution of Equations ( )( )
12 questions	24	5 questions

Squaring Binomials and Solving	Squaring and Multiplying Binomials in Brackets ( ) ( ) and Solving Equations
2 questions	2 questions.

Total number of questions on solving equations with

drill on transposition........................ 45.

Substitution in Simple Equations with

drill on Compound Multiplications and Transposition, and solving equations, ... 2 questions.

Pain Substitution... 1 question.

Total number of questions on Transposition, 48.

Miscellaneous Usages:

Questions on Formulae, (Centigrade and Fahrenheit thermometers) .... 3 questions.
Number of Verifications.......20.
Concrete Applications......... 6 "

Exercise XXXVII.

Theory: Equations with Fractional Coefficients.
Steps in the Solution of an Equation.

Solution of Simple Equations with Fractional Coefficients, with drill on Transposition:

Equations, such as, $3/2x=x+5$	Equations using Dividing Line $\frac{7x-2}{5}=\frac{4x-1}{2}$	Equations with Quantities in Brackets; e.g., $1/3(-3+y)=1/4(y-5)-1$
9 questions	24 questions	7 questions

Total number of Questions..................... 40.

Use of Decimals........ 4 questions.

Exercise XXXVIII.

Theory: Problems leading to Simple Equations.

Problems leading to Solution of Simple Equations, with transposition of numerical values only, .. 27 questions.

Problems leading to Solution of Simple Equations, with drill on transposition of unknowns,...... 14 questions.

Stating problems that will give rise to equations, ... 1 question (r. 4)

Total number of Questions........................ 42.

Miscellaneous Usages:

Use of Consecutive numbers......	3 questions.
Use of Denominate numbers......	5 "
Use of Per Cent	3 "
Use of Brackets.................	17 "
Problems on Age.................	3 "
Use of Fractions................	6 "
Problems on Area................	2 "
Problems on Triangles..........	1 "
Problems on Rate, Distance and Time,	1 "
Problems on Ration and Proportion,	1 "

Exercise XXXIX.

Theory: Algebraic Statements of Arithmetical Theorems.

To prove Arithmetical Theorems in the form of Algebraic Statements,......................... 7 questions.

Translating an Algebraic Statement into an Arithmetical Theorem,..........................1. question.

Total number of questions .... 8.

Miscellaneous Usages:

Consecutive numbers,..........	1 question.
Use of Integers...............	1 "

Exercise XL. Review of Chapter VI.

Definition of Identity and Equation,... 1 question.

Rules of Transposition, ... 1 question.

Solution and Verification of Simple Equations:

Simple Equations	Equations Using Dividing Line	Equations with Quantities in Brackets	
3	4	6	questions.

Equations involving Transposition:

Simple	Using Dividing Line	Using Brackets	
3	7	14	questions.

Translating of Arithmetical Theorems into Algebraic Statements,...................... 3 questions.

Total number of questions..................... 42.

Miscellaneous Usages:

Use of Decimals................	2	questions.
Problems on Ratio and Proportion	1	"
Problems on Age................	1	"
Problems on Time, Rate, Distance	2	"
Use of Denominate numbers.......	1	"
Use of Integers.................	1	"
Use of 'root' quantities.........	1	"
Use of fractions................	12	"
Problems on Per Cent............	1	"
Problems on Area .... ,......	1	question.
Use of Substitution.............	1	"

For a summary of this chapter, see chapter III. of this analysis.

Chapter 7.

"Simultaneous Equations"

Exercise XLI

Theory: Equations with Two Unknowns.

Simultaneous Equations, and Elimination.

Solution and Verification of Simultaneous Equations, (two unknowns);

Of the Type,	Of the type, (involving transposition)	
$3x+5y=18$ $2x+3y=12$	$x=3y+20;\ y=2x+20$	
17 questions	4 questions	Total, 21.

Solution of Simultaneous Equations, to determine the value of compound quantities, such as, $x+y$, ... 2 questions.

Solution of Simultaneous, Equations, involving simplification, such as, removal of brackets, transposition, Addition, 2 questions.

Solution of Simultaneous Equations with Substitution, ... 1 question.

Problem interpretation, leading to Simultaneous Equations.............. 1 question.

Total number of Simultaneous Equations.. 27 questions.

Number of Verifications, 21.

Exercise XLII.

Theory: Fractional Equations in two Unknowns.

Solution and Verification of Fractional Equations in two Unknowns:

Of the Type,	$1/2x+1/3y=3$ $x+y=7$	;	$3x-4y=0$ $\frac{x}{8}-\frac{y}{3}=15$	$1/2(-3+x)=9$ $1/8(-y+x)=4$
	3		3	7 questions.

Exercise XLII. (continued)

Solution of Fractional Equations in two Unknowns, involving transposition:

Of the type

$$x+1/3y=y-2 \qquad x+1/2y-1/2=y-1/3(x+y) \qquad \frac{x+y}{6}=\frac{y+x}{6}=7.$$
$$y+1/4x=x+6 \qquad 2y-x+1=1/3(2x+y+3)$$

3 -------- 3 --------------- 7 questions.

Solution of Simultaneous Equations with Decimal Coefficients, — $\begin{matrix} .3x+.5y=.23 \\ 6x+5y=2.6 \end{matrix}$, 3 questions.

Total number of questions, ... 27

Number of verifications,,........ 20.

Exercise XLIII.

Problems leading to Equations in two Unknowns:

Of the type, $4x+7y=242$; $5x+3y=268$, ... 19 questions.

Of the type, $1/20x-3/50y=3$; $7/100y-1/25x=7\ 1/2$.,

.... 5 questions.

Of the type, $3(x-y)=12$, etc. .... 2 questions.

Fractional equations with Dividing Line 1 (f.2) "

Fractional equations involving transposition of Unknowns, ... 1 question.

Equations of the first type above, involving Transposition......................... 2 questions.

Total number of questions .... 30.

Total number of verifications......... 30.

Miscellaneous Usages:

Problems on Age...........	2
Use of Per Cent	2

Exercise XLIII. (continued)

Miscellaneous Usages:

Problems on Rate, Distance and Time,	1 question.
Denominate numbers................	1 "
Use of Decimals.....................	2 "
Concrete Problems	18 "
Abstract "	12 "

Exercise XLIV. Review of Chapter 7.

Solution of Equations in two Unknowns:

(1)	(2)	(3)	(4)
Of the type 2x+3y=38, 3x+2y=37. ←	With fractional coefficient	Involving Transposition	
		Dividing Line Used	Quantities in Brackets
4 questions	1	5	3 (1 fract. coeff.)

Problems leading to Equations in two Unknowns:

Type (1) (See above)	Type 2	Type 3	Type 4.
6 questions	2 questions		1 question

Type (1) with Transposition, 1 question.

Quantities in Brackets with Transposition, 1 question.

Problems leading to Solution of Equations in one Unknown, ... 4 questions.

Solution of Simultaneous Equations with Substitution............................ 2 questions.

Solution for one Unknown in terms of another. (Simultaneous Equations)...... 1 question.

Total number of questions............ 31.

Miscellaneous Usages:

Problems on Per Cent.....	4
Problems on Age..........	2
Problems on Wages	1

See Summary Chapter III.

Chapter 8.

"Type Products And Simple Factoring"

Exercise XLY.

Theory: Factor.

Factoring by filling in blanks, $ax-3x= x(\quad)$

.... 9 questons.

Simple Factoring and Verification:

e.g., $a^2x + a^2(x-y)$, ... 18 questions.

Total number of questions......... 27.

Usages:

Brackets .... 3 questions.

Exercise XLVI.

Theory: Definition of Monomial, Binomial, Trinomial.

Product of two Binomials

Product of two Binomials:

Of the type:

	Binomials in Brackets,	Simplifcation, and checking, (addition)
$a+b$ $a+2b$	$(x-y)(x-4y)$	$(x+1)(x+2) + (x+2)(x+3)$, etc.
16	6	6 questions

Total number of questions.................. 28.

Use of fractional terms............. 1 question.

Exercise XLVII.

Theory: Factors of Trinomials.

Factors of Trinomials, such as, $a^2-3ab -2b^2$

Number of questions:

Oral, 15; Written, 12.

Factoring Trinomials to simplify expressions,

such as, $\frac{m^2-5m+6}{m-3} - \frac{m^2-7m+12}{m-4}$, ... 4 questions.

Exercise XLVII. (continued)

Factors common to Trinomials, such as, x^2-x-30 and $x^2-2x-35$, ...(f 2) ,, 1 question.

Three Factors of Trinomials, such as, $3a^2-3a-36$, ... 3 questions.

Problems requiring interpretation of Trinomial expressions, ... 2 questions.

Total number of questions................ 37 questions.

Exercise XLVIII.

Theory: Square Root of a Monomial.

Radical Sign.

Square Root of Monomials:

Numerical, such as, 36	Algebraic terms, such as, $25\ a^2$	Solving Equations, such as, $x^2=a^2b^2$
4	8	4 questions

Total number of oral questions........... 16

Written: Solving equations, such as, $(x-3)^2=49$, ... 3 questions.

Problems on the Square Root of Monomials:

To find side of Square .... 1 question.

To find radius of Sphere............. 1 question.

To find radius of Circle............. 2 questions.

Total number of questions...........23.

Concrete Applications......... 4 questions.

Exercise XLIX.

Theory: Squares of Binomials.

Expressing Squares of Binomials: e.g., a-b, squared, equals $a^2-2ab-b^2$, ... 13 questions.

As above with farctinal terms, 3 questions.

Simplification, involving squaring of Binomials, Additions,and Subtractions;e.g., $(x-1)^2+(x-2)^2-(x-3)^2$, ... 11 questions.

Substitution involving the squaring of Binomials; e.g., $a^2+b^2+c^2$ when $a=(x+y)$, etc. .... 1 question.

Addition and Subtraction of Quantities, involving the squaring of Binomials, ... 3 questions.

To find the sum of the squares of three Consecutive numbers, (Squaring Binomials) .... 1 question.

Numerical application on the use of the formula For the Square of Binomials:,eg..$(1234+1)^2$., 1 question.

Numerical application for squaring Binomials, with **mixed fractions**: e.g.,$(6\ 1/2)^2$, $(n+1/2)^2$, 1 question.

Total number of questions............. 34.

Concrete Applications................. 0

Exercise L.

Theory: Square Roots of Trinomials.

Express Trinomials, such as, $9a^2-24a+16$, as Squares, ... 12 questions.

To find Square Root of Trinomials, such as, $4x^2y^2-20ab+25$, ... 9 questions.

Exercise L. (continued)

Theory: Square Root of Trinomials.

Supplying missing term in trinomials to make perfect squares: e.g., $x^2 + --- - 4y^2$, ... 7 questions.

Square root of trinomial, and checking of results by substitution, ... 1 question.

Solution of Equations involving the square root of trinomials, ... 1 question, (3 parts).

To simplify the expressions in an identity, involving the square root of trinomials,.. 1 question.

Total number of Questions,.. Oral, 24, Written 7. (31)

Miscellaneous Usages:

Use of Identity, ... 1 question.
Use of fractional terms,.. 3 questions.
Number of Verifications, . 3
Drill questions .... 29.
Verbally abstract questions, 2 questions.

Exercise LI.

Theory: Product of the Sum and Difference.

Factors of the Difference of Two Squares.

Oral: Stating the products of the Sum and Difference: e.g., $(x-5)(x+5)$, ... 12 questions.

Factors of the Difference of two Squares, such as, $4p^2-9q^2$, ... 12 questions.

Written:

Simplification, involving Products of the Sum and Difference: e.g., $2(x-3)(x+3) - 2(3y-x)(3y+x)$.

Number of questions of above type, 4.

Exercise LI. (continued)

Product of the Sum and Difference of three Binomials, such as, $x-a$, $x+a$, x^2-a, ... 1 question.

As above, plus Addition, ... 1question.

To find three factors involving factoring the Difference of Squares: e.g., a^3-a, etc., 8 questions.

Simplification involving factoring the Difference of Squares, as $\frac{x^2-y^2}{x+y}$, etc., 2 questions.

Solution of Equations (one unknown), involving factoring the Difference of Squares, such as, $+\frac{x^2-1}{x+1} - \frac{x^2-9}{x-3} = 10.$, etc. , 1 question (2 parts).

To show that the difference between the squares of any two numbers is always equal to their sum., 1 question.

Total number of questions......... 42.

Use of Brackets......... 6 questions.
Use of Fractional Terms. 2' "

Exercise LII.

Theory: Numerical Applications of Products and Factors; Some Geometrical Applications.

Numerical Applications of Products and Factors:

Using short methods to find:

The Square of Numbers, such as, 98.	The Products of numbers such as, 91X59.	The values of Quantities, such as, 52^2-48^2	
1 (5 parts)	1 (4parts)	1 (5 parts)	questions.

Solution of Equation involving numerical applications of the Difference of Squares; e.g., $7x = 64^2-57^2$, 1 question.

Exercise LII. (continued)

Solution of Equations by substituting values for unknowns and factoring Numerical Applications of Difference of Squares, ... 1 question.

To find the difference of the areas of squares, whose sides a and b are of different values; e.g., $a=41$, $b=40$, find the value of (a^2-b^2)., 1 question. (f.6)

To find the difference in the areas of circles, whose radii are R and r of different values, such as, $R=4$, $r=8$: find the value of $3\ 1/7(R^2-r^2)$,

.... 1 question, (6 parts).

Total number of questions, ... 7.

Use of Decimals, ... 1 question.

Exercise LIII. Review of Chapter 8.

Simple factoring: e.g., $3x-6y$, ... 4 questions.

Factors of Trinomials, as, a^2-2a+1, 7 questions.

Factoring the Difference of Squares 6 questions.

Solution of Equation involving Square Root of Monomials,, $(x^2=100)$., ... 2 question. (6 parts)

Square Root of Trinomials, 1 questions (5 parts)

Squaring Binomials, ... 2 questions.

Substitution on Formula involving Square Root of Monomial, ...$(a= r^2)$,....... 1 question. (f.2)

Numerical Application of the Difference of Squares, ...(97×103)......................... 1 question (f.2)

Of the type, 997^2................. 1 question (f.5)

Exercise LIII.

Simplification, involving factorin the Difference of Squares, product of Binomials, Addition, cancellation, use of brackets, etc., ... 4 questions.

Miscellaneous Usages:

Use of Decimals.............. 1 question.
Use of fractional terms ..... 3 questions.

For Summary, see Chapter III.

Chapter 9

"Simple Applications of Factoring"

Exercise LV.

Theory: Algebraic Fractions; Changes in the Terms of a Fraction; Lowest Terms.

Reducing fractions to lowest terms:

By Filling in Blanks, of the type:

$\frac{15}{20} = \frac{}{}$, or $\frac{a(p+q)}{} = \overline{6ab^2}$

5 questions

$\frac{14}{21}$ 1

$\frac{15a}{25}$ 7

$\frac{4x}{2x^2-8}$ 7

$\frac{a(a-b)}{(a-b)^2}$ 4

$\frac{x^2-3x+2}{x^2-4x+3}$

1 questions

$\frac{3x^2-3y^2}{3x^2+9xy+6y^2}$

5 questions

Total number of questions, ... 30 questions.

Exercise LVI.

Theory: Multiplication and Divisions of Fractions.

Simplification with drill on multiplication and division of fractions, such as, 4/5 x 5/6 or $\frac{6a^2}{5b} \div 12a$

Numerical Fractions	Numerical and Literal Fractions	Literal Coefficients forming Fractions	
2	4	3	Monomials.
	2	1	Binomials.
	1		Binomials and Trinomials.
	2		Trinomials.

Total number of questions, ... 15 questions.

Exercise LVIII.

Theory: Addition and Subtraction of Fractions.

Reduction to fractions with lowest common denominator: e.g., $\frac{1}{a}$, $\frac{1}{a^2}$.

	Numerical Fractions	Numerical and Literal Fractions	Literal Fractions
Monomials	1	10	2
Binomials		1	

Number of oral questions, ... 14.

Addition and Subtraction of Fractions:

e.g., $\frac{x-y}{2} + \frac{x-y}{3} - \frac{x+y}{4}$, etc.

	Addition	Addition and Subtraction	Addition	Total
Monomials	1			1
Monomials and			1	1
Binomials	6	3	4	
Binomials and		1		1
Trinomials	1			1
Totals	8	4	5	17

Exercise LVIII. (continued)

Miscellaneous Usages:

Checking by substitution, ...	1 question.
Factoring Difference of Squares...	3 questions.

Total number of questions........... 31.

Exercise LIX.

Theory: Mixed Expressions; Reduction of a Mixed Expression to a Fraction; Reduction of a Fraction to Mixed Expression.

Reduction of a mixed expression to a fraction:

e.g., $2 + \frac{5}{6}$, or $x + \frac{xy}{x-y}$:

Numerical Terms	Numerical and Literal Terms	Literal Terms	
1	6	3	Monomials.
	2	2	Monomials and Binom.
(Oral. 9)		1	Trinomials.

Total number 15

Reduction of Complete fractions to mixed expressions:

e.g., $\frac{6a-2b}{3ab}$,	$\frac{a - 7b - 3c}{21\ ab}$	
7	2	questions.

Total number of questions.................. 24.

Exercise LX. Review of Chapter

Reduction of fractions to lowest terms:

e.g., $(\frac{a^2ab}{a})$ $\frac{a^2 + ab}{a^2}$, etc.(f.8).......... 2 questions.

Simplification:

Division and Factoring.	Multiplication of Fractions Numerical Fractions	Multiplication and Division of Fractions	Mult. and Factoring
3	1	1	1

Exercise LX. (continued)

Simplification: e.g., $\frac{x-3}{3} + \frac{x+4}{4}$.

Addition of Fractions	Addition and Subtraction of Fractions	Subtraction of Fractions
3 questions	2 questions	2 questions

Reduction of fractions to lowest terms involving factoring the Difference of Two Squares: e.g., $\frac{a^2-b^2}{a^2b^2}$,
.... 1 questions (f.3)

Solution of Equation involving factoring:
e.g., $(a-b)x = (a^2-b^2)(a+b)$: .... 1 question.

To find the missing term in the expressions of an identity, $\frac{(x^2-5x+ --)}{(x^2-9x+20)}$, etc..,,,. 1 question.

Total number of questions.... 22.

Miscellaneous Usages:

Factoring the Difference of Squares,
.... 4 questions. (f.9)

Factoring Trinomials.... 4 questions.

Exercise LIV. and LVII.,of this chapter are not included in the Algebra I outline and hence were omitted from this analysis. All questions pertaining directly to H.C.F. and L.C.M. were not recorded.

For a summary of this chapter, see Chapter III. of this investigation.

Chapter 10.

"Review Of The Simple Rules"

Exercise LXI.

Theory: Use of Brackets.

Removal of brackets, change of signs: e.g., $a - \{b-(c-d)\}$, ... 12 questions.

Simplification, with drill on removal of brackets, change of signs, multiplication, addition and subtraction of quantities: e.g., $2a-\{3a-2(a-2b)\}$, etc. .... 8 question.

Same as above involving division, ... 1 question.

Addition of quantities involving removal of brackets, with change of signs: e.g., $3x-2(y-z)$, $3y-2(z-x)$, etc., ...2 questions.

As above, involving removal of horizontal bar: e.g., $1-\overline{x-y}$, $1-\overline{x-y}$, ... 1 question.

Removal of brackets and expression of quantities in descending powers of x: e.g., $2x(3x-2)-5(x-3)+6x(x-1)$. etc., ... 3 questions.

Solution and verification of equations, involving simplification, such as, removal of brackets, change of signs, multiplication, addition and subtraction of quantities: e.g., $1/3(27-2x)-9/2= 1/10(7x-54)$

Fractional Equations	Whole Integers
2 questions	3 (equations)
	Total, 5.

Total number of questions, ..31

Use of fractional terms.,,,.... 3 questions.

Exercise LXII.

Theory: Insertion of Quantities in Brackets.

Collecting Coefficients.

Insertion of Quantities in Brackets:

To express:	Number of ways	Number of Questions
Trinomial as a Binomial	3	1
Polynomial as a Trinomial	4	1
Polynomial as a Binomial	4	1
Polynomial as Binomials and Trinomials ,,,,	in alphabetical order	1
Total number of questions		4

Collection of Coefficients of x and y:

e.g., $x(a-b)+y(b-c)-d(x+y)$, etc.

Quantities originally in brackets	Quantities originally in brackets
2 questions.	3 questions

Arranging in descending powers of x, involving collection coefficients: e.g., $a(x^2+4x-3)-b(3x-5x^2)$,

.... 2 questions.

Total number of questions......... 12 questions.

Use of Brackets............. 5 questions.

Exercise LXIII.

Theory: Multiplication with Detached Coefficients.

Multiplication and (checking) of:	by a Binomial	by a Trinomial
Trinomial	4 questions	7 questions
Polynomial		1 "

(e.g., $\left(\frac{a^{2r}-ab-b^2}{a-b}\right)$

Total, 12.

To find the product of quantities, like,

$(1-x)(1+x)(1+x^2)(1+x^4)$, ... 4 questions.

Solution of Equations involving multiplication with detached coefficients; e.g., $(x-2)(x-4)(x-6)=(x-1)$, etc.

.... 1 question.

Exercise LXIII. (continued)

Multiplication with Detached Coefficients:

e.g., $3x^3-4x^2+7x-3$ by x^2-2x-1.

Multiplication of a:

	by a Binomial	by a Trinomial.
Trinomial	1	0 questions.
Polynomial	2	1 "

Simplification involving multiplication with detached coefficients: e.g., $(a+b)(c+d)-(a-b)(c-d)$, etc.
.... 8 questions.

To find the coefficients of x in the products of quantitieslike, x^3-4x^2-5x-2 by x^2-2x-3, 4 questions.

Pointing out errors in statements, such as,
$ab(a+b)(a^2+b^2) = a^4b + a^2b + a^2b^3 + a\,b^4$,
.... 1 question (f.3)

Substitution of numerical values in the formula, $(a-b)(b-1)- ab-(a-b)-1$, to find the product of two numbers, given the product of two respective consecutive numbers,...................... 1 question.

Total number of questions.......... 41.

Miscellaneous Usages:

Substitution	2 questions.
Use of brackets	15 "

Exercise LXIV.

Theory: Division by a Compound Quantity.

Verifying Division: Division with Detached Coefficients.

To state the quotients of divisions, such as,

$$\frac{x^2+3x+2}{x+1}$$

Division of a	by a Binomial
Trinomial	4 questions.
Binomial	2 "

Exercise LXIV.

Division (and verification) by a compound quantity: e.g., $6x^2+x-15$ divided by $2x-3$

Division of a	by a	Binomial	Trinomial	
Trinomial		8		
Polyndmial	" "	6	5	Total, 19.

Division with Detached Coefficients:

e.g., x^3-3x^2-3x-1 divided by x^2-2x-1, .. 6 questions

Simplification involving division by compound quantities, such as, $\frac{x^3+y^3}{x+y} = \frac{x^3-y^3}{x-y}$,.. 3 questions

Division by compound quantities, such as, a^3-1 divided by $a-1$, ... 3 questions.

Division with detached coefficients: e.g., to divide without removing brackets, $ax^2+(b+ac)x+bc$, by $ax+b$.

Division of a	by a Binomial	Trinomial	
Trinomial	2	0	questions.
Polynomial		2	"

Solution of Equation, involving division by compound quantities, ... 2 questions.

Total number of questions..... 43.

Use of Brackets, ...5 questions.

Exercise XLVI.

Theory: Inexact Division.

To find the remainder on dividing: ($a^2-20a-70$) (by $a-5$)

	by a Binomial	by a Trinomial	
Trinomial	1	1	
Polynomial			Total, 6
Binomial cube	2		

Exercise LXV. (continued)

To express expressions such as, $\frac{2a-3b}{a+b}$, as mixed quantities:

	by a Binomial
Division of a Binomial	3 questions
Trinomial	1 "

To find four terms in the quotient of:

Expressions of the type:

$1 \div (1-x)$,	$\frac{1}{1-x}$
2 questions	2 questions.

Given the dividend (divisor), the quotient and the remainder, to find the divisor, ... 1 question.

To determine what value of 'a' will make x^2-5x+a divided by $x-2$, to make an exact division, ... 2 questions.

To prove identities involving inexact division: e.g., $\frac{a^2+b^2}{a-b} = a+b + \frac{2b^2}{a-b}$, 1 question (f.2)

Total number of questions...... 18 .

Exercise LXVI. Review of Chapter 10.

Addition of Compound Quantities, ... 2 questions.

Subtraction of Compound Quantities,... 8 questions.

Addition and Subtraction of Compound Quantities................................. 1 question.

Simplification, involving, addition, subtraction, removal of brackets, change of signs, etc. : e.g., $a-(3b-4c)-(b+c-a)-2(a-c)$, 2 questions.

Substitution in compound quantities, for Unknowns. .... 3 questions.

Exercise XLVI. (continued)

Multiplication of Compound Quantities:

Multiplication of a	by a Binomial	by a Trinomial	
Binomial	2		questions.
Trinomial		2	"
Polynomial		2	"

Division by Compound Quantities:

Division of a	by a Binomial	by a Trinomial
Binomial	2	1
Trinomial		2
Polynomials		7

Inexact Division (finding remainder),.. 1 question.
" " (finding dividend).... 1 question.

Substitution involving Inexact Division, 2 questions.

Addition of terms to make an even division, 1 quest.

Substitution of compound values involving simplification: e.g., If $s = a+b+c$, find the value of $a(s-a)+b(s-b)+c(s-c)$, ... 4 questions.

Collecting Coefficients:

Of the product of 2 Polynomials	Division of a Trinomial by a Trinomial	Subtraction of 2 Trinomials	Sum of the Coefficients of a Polynomial
1 question	1 question	1 question	1 question.

Product of 3 Binomials (coefficients), 1 question.

Arranging quantities in descending powers of x; e.g., $c(ax-b)-x(a-b)+bx(x^2-cx)$, ... 3 questions.

To prove identities, involving simplification, factoring, etc.,: e.g. $a(b-c)-b(c-a)-c(a-b)-(a-b)(b-c)(c-a)$, ... 3 questions.

Total number of questions.................. 52.

See Summary, Chapter III.

Chapter 11.

"Factoring (continued)"

Exercise LXVII.

Theory: Factors common to every Term.

Factors by Grouping.

Factors common to every Term:

Of the type,

a^2-3a $x(a-b)-2y(a-b)$

6 questions   3 questions.   Total, 9.
(Oral)

Factors by Grouping:

Using two different methods of grouping, and verification by multiplication of questions of the type,

$bx-ax+ab-x^2$, ... 10 questions.

To find three factors of two polynomials, 1 question.

To find a common factor of 2 polynomials, 3 question.

Factor by gruping polynomials of the type,

$48ax-56ay-35by+30bx$; ... . 3 questions.

Total number of questions....26.

Exercise XLVIII.

Theory: Complete Squares; Square of a Trinomial.

To find squares of quantities, such as,

$2a-3b$ $x+y-z$ $p-q-r+s$

10 questions   3 questions   3 questions.
(2 with fractional coefficients)   Total, 16.

Express as Squares, trinomials, such as,

$x^2-6x+9y^2$......... (one fractional coefficient)

.... 9 questions.

Exercise LXVIII. (continued)

To find the square roots of :

Trinomial, such as, $x^2y^2-10xyz+25z^2$ 3 questions

Squares of Trinomials, such as, Of the type, $a^2+b^2+c^2-2ab+2ac-2bc$. 4 questions

Of the type, $(a+b)^2-2c(a+b)+c^2$, ... 1question.

Simpification involving Squares of:

Binomials: e.g., $(3x-y)^2+(x-3)^2+(2x+3y)^2$ 2 questions

Trinomials, such as, $(a-b+c)^2+(b-c+a)^2+(c-a+b)^2$ 3 questions.

To complete squares by supplying the missing terms:

Squares of Binomials, such as x^2 .....$+25$ 4 questions.

Squares of Trinomials, such as, a^2+9b^2+ ....$-6ab-2ac$... 2 questions.

To find three factors of a trinomial, involving thesquare root of a trinomial: e.g., $3x^2-6x-3$, 1 question.

To find the square root of a trinomial, such as, $(a+b)^2+4c(a+b)+4c^2$,.................... 2 questions.(f.3)

Substitution, involving squares:

To find the value of $x^2-\frac{1}{x^2}$, if $x-\frac{1}{x}=4$ 1 question

If $x-a-2b-3c$, find the value of $x^2+y^2+z^2+2xy+2xz+2yz$. 1 question.

To express as squares:

Sum of the Squares of two Integers 1 question

Sum of two Squares in $a^2x^2-b^2y^2-a^2y^2-b^2x^2$ 2 questions

Division of the Sum of the Squares of Trinomials by the sum of the Sq. of Binomials. 1 question.

Total........ 52.

Exercise LXIX.

Theory: The Difference of Squares.

Use of formula to obtain the product of the Sum and Difference: e.g., $(4x-1)(4x+1)=16x^2-1$.:

Of the type, $(3a-2)(3a+2)$	Of the type, $(a-b-c)(a-b+c)$	Of the type, $(a+b-c+d)(a-b-c-d)$	Oral, 10.
8 questions (1 fractional)	6 questions	2 questions	Total, 16.

Factoring and verifying the Difference of Squares:

Of the type, x^2-9	Of the type, $(x-y)^2-25$	Of the type, $(a+b)^2-(c-d)^2$	Of the type, $a^2-x^2+2ay+y^2$
8	6	1	6 questions.

Of the type, $a^2-b^2+c^2-d^2-2ac-2bd$, ... 6 "

To find four factors of $a^2b^2-a^2c^2-b^2d^2+c^2d^2$.

1 question, (f.2)

Of the type, $(x-3b)^3-4bx^2+32b^3$ or $5a^2-10ab+5b^2-20c^2$

1 question, (f.2)

To find three factors of a^3-a, etc.

1 question, (f.3)

Factors of the type, $m^2-9m^2n^2-2mn+n^2$

1 question (f.2)

To find the simplest factors of $3x^2-2x^2-3x+2$

.... 1 question (f.2).

Simplification involving Difference of Squares:

Product of Sum and Difference, $(a-b+c)(a-b-c)+(a+b-c)(a-b+c)$

1 question

Of the type, $(a^2-3a+1)^2-(a^2-3a)^2$

1 question (f.4)

Rearranging compound quantities by factoring the difference of Squares, to obtain a given factor: e.g., Arrange $a(b^2-c^2)+b(c^2-a^2)+c(a^2-b^2)$ in the form $a(b^2-c^2)+bc(b-c)-a^2(b-c)$ and obtain $a-b$, .. 3 questions.

Product of Sum and Difference and factoring to obtain the product in a different form: e.g., factor $(a+b+c)(a+b-c)(a-b+c)(a-b-c)$, etc, 1 question.

Total, 54.

Exercise LXX.

Theory: Incomplete Squares

Factors and verification of Incomplete Squares:

Of the type, a^4-a^2-1 — 11 questions; $4a^4-1$ — 1 question. Total, 12.

Three factors of the type, a^4+a^2+1 — 3 questions

Four factors of x^8+x^4+1 — 1 question

Four factors of $a^2+b^2+c^2-2ab-2bc-2ca$ by completing the square of $a^2-b^2+c^2$ — 1 question

Factoring $(a+1)^4+(a^2-1)^2+(a-1)^4$ — 1 question

Total number of questions,.......... 17.

Exercise LXXI.

Theory: Trinomials: First Methdd, by Cross Multiplication (factoring): Second Method, by Decomposition.

Factoring by the method of "cross multiplication" or by "decomposition" quantities like $2x^2+7xy+3y^2$, ... Number of oral questions, 18: written, 12.

To find the simplest factors of:

the type, $2a^2+8a+6$ — 2; a^5-10a^3+9a — 4; $(x^2-9x)^2+4(x^2-9x)-140$ — 2 questions.

To show $(x^2-x-2)(x^2+2x-15)=(x^2-6x+5)(x^2-5x+6)$, by factoring,.,,,,,,,,,..................... 1 question.

Factoring quantities, such as,

$x^2+5xy+4y^2+x+y$ — 2 questions

The product of x^2+3x+2 and x^4-1 divided by the product of x^2+2x+1 and x^2+x-2. — 2 questions

Exercise LXXI (continued)

Theory: as before.

Division by means of factroing: e.g.,"Show that the product of $6x^2-13x+6$ and $2x^2-7x+5$ is divisible by $3x^2-5x+2$ and find the quotient., 1 question.

To find the values of "a" as an integral coefficient in $3x^2+ax-14$, ... 1 question.

Division by factoring: e.g., show that x^2-x-6 is divisible by $x-2$, ... 1 question.

Total number of questions, ... 46.

Exercise LXXII.

Theory: Sum and Difference of Cubes.

Factoring the Sum or Difference of Cubes:

State one factor of:

Sum of Cubes, as, x^3+8	or $(a-b)^3+c^3$	Difference of Cubes, as, $27-b^3$	or $(a-b)^3-c^3$
3 questions	1	7	1

Total number of Oral questions, 12.

Factors (and verification of the Sum and Difference of Cubes:

Sum of Cubes, as, a^3+b^3	or $(x-y)^3-a^3$	Difference of Cubes, as, a^3-y^3	or $(a-b)^3-c^3$
2 questions	1	7	1

Of the type, x^6-b^3	a^6+b^6	$(a-b)^3+a^3$	$(2x-y)^3-(x-2y)^3$	$(a^2-2bc)^3-8b^3c^3$
2	1	2	1	1 (f.2)

Exercise LXXII~~I~~.

Find 6 factors of $a^{12}-b^{12}$; .... 1 question.

Show that $(a+b)^4-3ab(a+b)^2=(a+b)(a^3+b^3)$, 1 question.

Show that $(2a-3b)^3+(3a-2b)^3$ is divisible by $a-b$, ... 1 question.

Find to Binomial factors of $(2x^2-3x+3)^3-(x^2-2x+5)^3$ .... 1 question.

Substitution involving factoring the Sum and Difference of Cubes: e.g., "If $x-\frac{1}{x}=2$, find the value of $x^3-\frac{1}{x^3}$, ... 1 question.

Total number of questions........... 37.

Number of verifications, ...9.

Exercise LXXIII.- Factor Theorem is omitted.

Exercise LXXIV.

Theory: Equations Solved by Factoring.

Quadratic Equation.

Drill on equations of the first degree in:

$(x-1)(x-2)=0$	x^2-4x+3	x^2-4	
4 questions	1	5 questions	Total, 10.

State equations whose roots are: e.g. 2 and 3.

.... 6 questions.

Solution and verification of Quadratics:

Of the type,

$x^2-8x+15=0$	$2x^2-x=15$	$x(3x-1)=10$	$x^4-ax+bx-ab=0$	$x^2-x=0$
6 question	1	1	1	1

To find the roots of a quadratic, when one root is given, ... 1 question (f.2)

Solve $x\ -6x\ -11x-6-0$ (sum of coefficients, zero) .... 1 question (f.2)

Exercise LXXIV.

Problems leading to Quadratic equations: e.g.,

$x^2+x=42$	$x^2+(x+1)^2=61$	$(x+2)^2-(x-1)^2-x^2=0$	
1	1	1 question	Total, 3.

Total number of questions, ... 31.

Miscellaneous Usages:

Problems on consecutive numbers,	1
Problems on triangles, ...	1

Exercise LXXV. Review of Chapter 11.)

State the squares of:

Binomials, such as, $(a+b)$ or $(a-b)$ or $(a-1)$, $a-\frac{1}{a}$	Trinomials, such as, $a+b+c$, etc.
1 question, (f.10.)	1 question (f.3)

Write down the products of:

	$x(a-b)$	$a(a-b+c)$	$(x-1)(x+7)$
1 question..	(f.1)	(f.1)	(f.5)

Use of short methods to find, in the simplest form, the value of:

Sum and Difference of Two Squares: e.g., $(x+a+b)(x+a-b)+$, etc.	Factors of the Difference of Two Minomial Squares: e.g., $(a+99)^2-(a-98)^2$
2 questions	1 question

Numerical Applications of the Difference of Two Squares: e.g., 9999^2-9998^2	Product of 503x497	Squares of Trinomials, $(a+b+c)+$ etc.
2 questions	1	2 questions.

Exercise LXXV. (continued)

Find the simplest factors and verify:

By Method of Cross Multiplication: e.g., x^2-x-42

By the method of Decomposition: e.g.,

8 questions ------------------(same)

Complete Squares: e.g., $18x^2+48x+32$

2 questions.

Complete Squares and Grouping: e.g., $a^2+2ab+b\ +ac+bc$

2 questions

Complete Squares and Difference of Squares: e.g., $x^4-y^4-18x^2y^2$

2 questions

Factors by Grouping: e.g. $x^2+ax\ -a-x$

8 questions.

The Difference of Two Squares: e.g., $x^3-4x=x(x^2-4)$

3 questions

Difference of Trinomial Squares: e.g., $(a+2b-3c)^2-(3a+2b-c)^2$

1 question

Difference of Squares and Grouping: e.g., $1+2ab-a^2-b^2=$ etc.

5 questions

Produc of Sum and Difference and factoring: e.g., $(a+c)(a-c)-b(2a-b)$

3 questions

Difference of Cubes: e.g., $343-x^3$

4 questions.

Difference of Cubes and Grouping: e.g., $x^3-y^3-2x^2y+2xy^2$

1 question

Sum of Cubes and Grouping: e.g., $x^3+y^3+3xy(x+y)$

3 questions

Cross Multiplication, and Grouping: e.g., $2x^2-ax+bx-ab-a^2$

1 question

Difference of Cubes, Difference of Squares and Grouping:

e.g., $x^3+x^2+x-y^3-y^2-y$, ... 2 questions.

Grouping, and Difference of Squares: e.g.,

$a^7-a^3+8a^4-8$, ... 2 questions.

"Factor $4a^4-37\ a^2b^2+9b^4$, (1) by cross multiplication, (2) by completing the square of $2a^2-3b^2$, (3) by completing the square of $2a^2+3b^2$,".............. 1 question.

Exercise LXXV. (continued)

To show by means of factoring (cross multiplication) that $(x^2-4x+3)(x^2-12x+35) = (x^2-6x+5)(x^2-10x+21)$, 1 quest.

A diagramatic representation of $a+b+c+d$, 1 quest.

Find four factors of $(x^2-5x)^2-10(x^2-5x)+24$,
(by cross multiplication)........... 1 question.

Find four factors of $(a^2-b^2-c^2+d^2)^2-4(ad-bc)^2$,
.... 1 question.

Factoring by grouping: e.g., to find the quotient when the product of $x^2-(b-c)x-bc$ and $x^2-(c-a)x-ca$ is divided by $x^2+(a-b)x-ab$, ... 1 question.

Factors of the Difference of Squares: e.g., $a^2-b^2-c^2+2bc$ multiplied by $\frac{a+b+c}{a+b-c}$, ... 1 question.

To express $a^2b^2+c^2d^2-a^2c^2-b^2d^2$ in four different ways.' (Grouping) ,,,......... 1 question.

Factor $a^4+b^4+c^4-2a^2b^2-2b^2c^2-2c^2a^2$ by completing the square of $a^2-b^2-c^2$, ... 1 question.

If $x^4+x^3+ax^2+bx-3$ is divisible by $x-1$ and $x+3$, find a and b and the remaining factors,,... 1 question.

Total number of questions, ... 67.
Miscellaneous Usages:

Verifications..................	18.	questions.
Cross Multiplication..........	10	"
Difference of Squares..........	10	
Grouping.......................	32.	

Chapter 12.

"Simultaneous Equations (continued)"

Exercise LXXVI.

Theory: Elimination by Substitution; Elimination by Comparison; Three Methods of Elimination.

State the value of each unknown in terms of the other in equations, like, $x+2y=7$, ... 6 questions.

Solve by Comparison and verify, simultaneous equations, such as, $\begin{matrix} 2x-y=19 \\ 5xa3y=46 \end{matrix}$, ... 3 questions.

Solve by any method:

Simultaneous Equations with Fractional Coefficients: e.g.,
$1/3x-1/5y=2$
$2/3x+3/5y=9$

4 questions

$\frac{x}{2}=\frac{y}{3}$, $\frac{y-5x}{12}=12$

6 questions

Simplification:
$(x-1)(y-2)-(y-3)(x-1)=17$
$(x-3)(y-5)-(x-5)(y-3)=-22$.

1 question.

Simultaneous Equations with Decimal Coefficients:
$.1x+.21y+.52=.01x+.01y+3=0$

1 question

Simultaneous Equations of the type, $x-5y+3=2x-8y+3=7x+10y-16$

1 question.

Total number of questions.,............... 28.

Miscellaneous Usages:

Verbal questions............ 1.
Use of decimals,............ 1.
Use of fractional terms......12.

Exercises 77, 78, and 79, are not included in the course.

Exercise LXXX.

Theory: Problems leading to Simultaneous Equations.

Exercise LXXX. (continued)

Problems translating themselves algebraicly into the following types of Equations:

Of one Unknown:

$7x-5x=10$ $\frac{x-2}{x+1}=\frac{5}{6}$ With fractional coefficients, $x-2+x+3+1/2x=26$

5 .... 2 .... 3 questions.. Total, 10.

Problems leading to Simultaneous Equations of the following types:

$10x+4y=96$
$7x-10y=96$

10 questions.

With Fractional Coefficients, $x-y=200$, $11/10x-19/20y=3/10$.

2 questions

Use of Dividing Line, $\frac{x+1}{y+1}=\frac{1}{3}$
$\frac{x}{y-9}=\frac{1}{9}$

5 questions

Substitution in Formula:
e.g., When $m=10$, $n=15$,
find value of $\frac{mn}{m+n}$

1 question.

Equations in three unknowns, as,
$x+y=29$, $x+z=33$, $y+z=36$, etc.

9 questions.

fractional equations,
$\frac{1}{x}+\frac{1}{y}=\frac{1}{2}$, $\frac{1}{x}+\frac{1}{z}=\frac{1}{3}$, etc.

1 question.

Translation of a problem into the equation, $\frac{1}{x}-\frac{1}{m}=\frac{1}{n}$, or $\frac{mn}{m+n}$, 1 question.

Total number of questions.................. 39.

Miscellaneous Usages and Applications:

Use of fractional terms, ...	11	questions.
Digit questions.....................	9	"
Use of "reciprocals................	2	"
Problems on work	3	"
Problems on Wages	3	"

Exercise LXXX. (continued)

Miscellaneous Usages and Applications (continued)

Geometrical applications.......	2 questions.
Problems on rate, distance, and time, ...	1 "
Problems on Per Cent...........	3 "
Substitution in Formulae........	1 (f.3.

For Summary of this exercise, see Chapter III.

CHAPTER V.

CONCLUSIONS

CHAPTER V.

A survey of Crawford's High School Algebra as a whole, indicates the following facts:

1. The portion of the book outlined for the course in Algebra 1 bears a direct relation to the remainder of the text.

2. The algebraic principles and processes are introduced in order of complexity.

3. Many topics are followed up and further elaborated on, in subsequent chapters.

4. Only one general review, Chapter X, "Review of Simple Rules" is given in the text.

5. The course in Algebra 1 covers about two-fifths of the book.

An examination of the Algebra 1 course indicates:

1. The topics of each of the chapters are arranged in logical sequence. Whether this sequence is the best possible, is doubtful. A more natural approach to a first course in algebra may well be made by introducing the formula with its various applications. Other topics with their ramifications may well be arranged in the order of their importance and usefulness.

2. Each chapter, with the exception of Chapter X, deals primarily, with its own specific topics. One chapter is given to "Algebraic Notation", two to "Simple Equations," one to "Positive and Negative ", one to "Addition and "Subtraction", one to "Multiplication and Division", two to

"Simultaneous Equations", two to "Factoring and Type Products", one to "Simple Applications of Factoring, and one to a "Review of the "Simple Rules". There is an apparent relationship between the various chapters. Yet each is identical ~~education~~al in itself.

3. The plan of the text is more of a logical nature than a psychological one. Each new topic is introduced correlative with other similar topics. The material is cumulative in its arrangement, so that one process may be used to perform another. Definitions are introduced as they are required.

4. The content and method of presentation of the subject matter in the text Algebra 1, are seemingly out of harmony with the recommendations with respect to Algebra, in the report of the National Committee on the Reorganization of High School Subjects. The committe, in its report, recommends the formula, equations, graphs, directed numbers, and an introduction to trigonometry as the topics of greatest importance. Crawford's text is deficient in both formulae, and graphs, and gives nothing on elementary trigonometry. Graphs are to some extent linked up with directed numbers but are entirely divorced from equations.

5. The text as a whole does not show enough correlation to other related subjects. There is some correlation with arithmetic and to a lesser degree with geometry, but much too little to give enough significance to the purposes and utilities of Algebra.

6. Criticism has been levelled against the terminology used in some sections of the book. Phrases like "unknown

quantities", "solving simultaneous equations", "finding x, and others have been found to be#"misleading", whilst terms such as constants and variables are not introduced in the text till a further part of it, not included in the Algebra 1 course.

Each new topic is followed by carefull graded exercises with sufficient drill in the processes described. The questions and problems given are presented in gradual order from easy to more difficult. A few problems are applied to what might be genuine situations. The greater portion of them deal with more or less artificial situations.

The greater part of the various topics deal with their own peculiar algebraic principles or processes, that is, each topic is blocked out into a separate compartment, with very little transfer from one compartment to another. At the end of each chapter, is given a review exercise of the various exercises given in its respective chapter.

No provision is made in the text for tests or special drill exercises.

It is the opinion of the writer that the results of the present analysis seem to show that although there are some worth while features about Crawford's High School Algebra, it is as a whole somewhat out of date and not well suited to an introductory course in Algebra.

# See Preface, "Theory of Equations for Beginners." by D.L.Shortliffe,M.A.

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